

MPEG-7 Systems Tools

- An Overview -

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Outline

The overall picture

- Tasks of MPEG-7 Systems
- Systems Tools

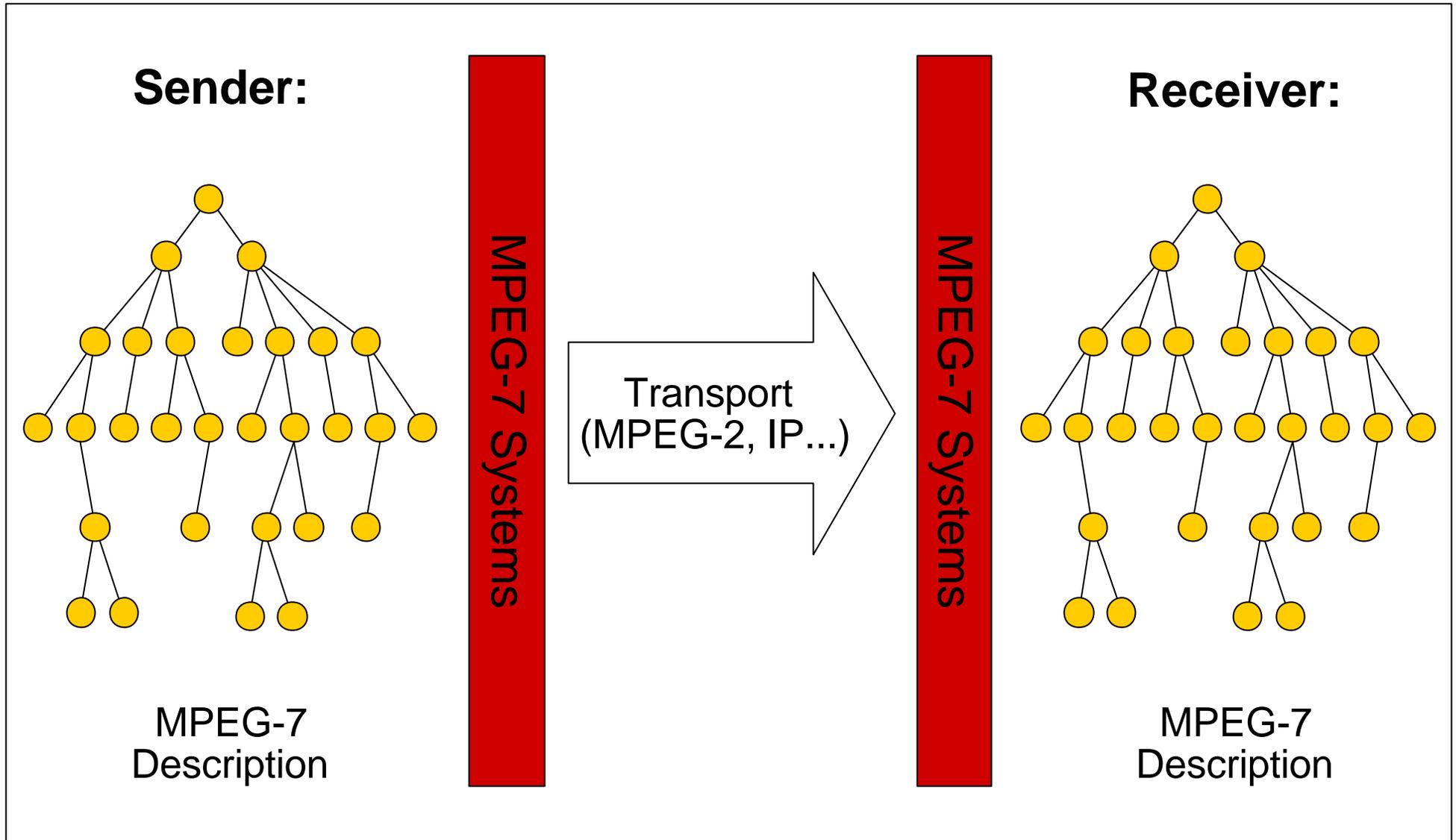
Flexible transmission of MPEG-7 descriptions

- Access Units and Fragment Update
- Dynamic update of descriptions

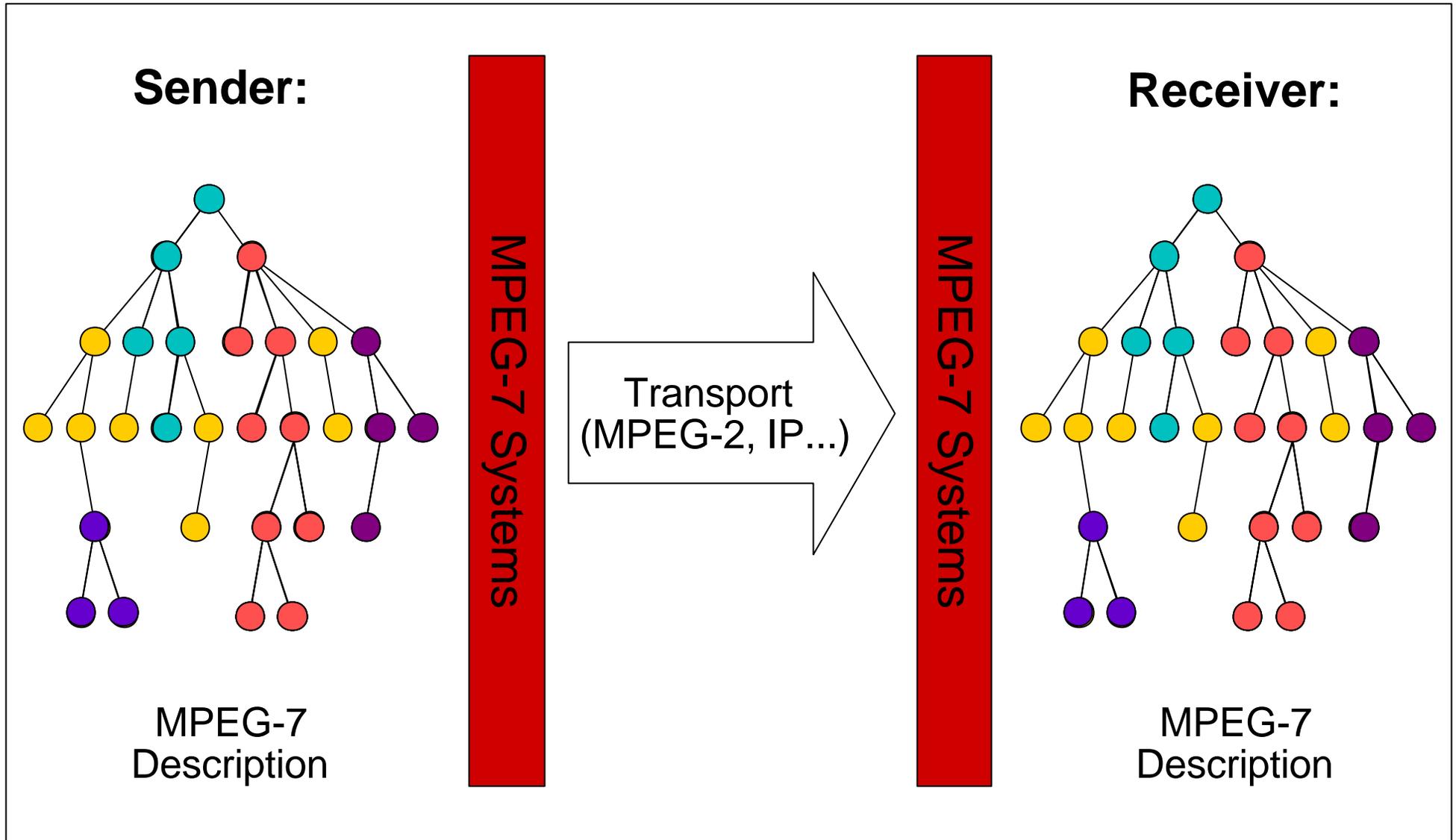
Compression of MPEG-7 descriptions

- **MPEG-7 BiM** (Binary format for MPEG-7 data)

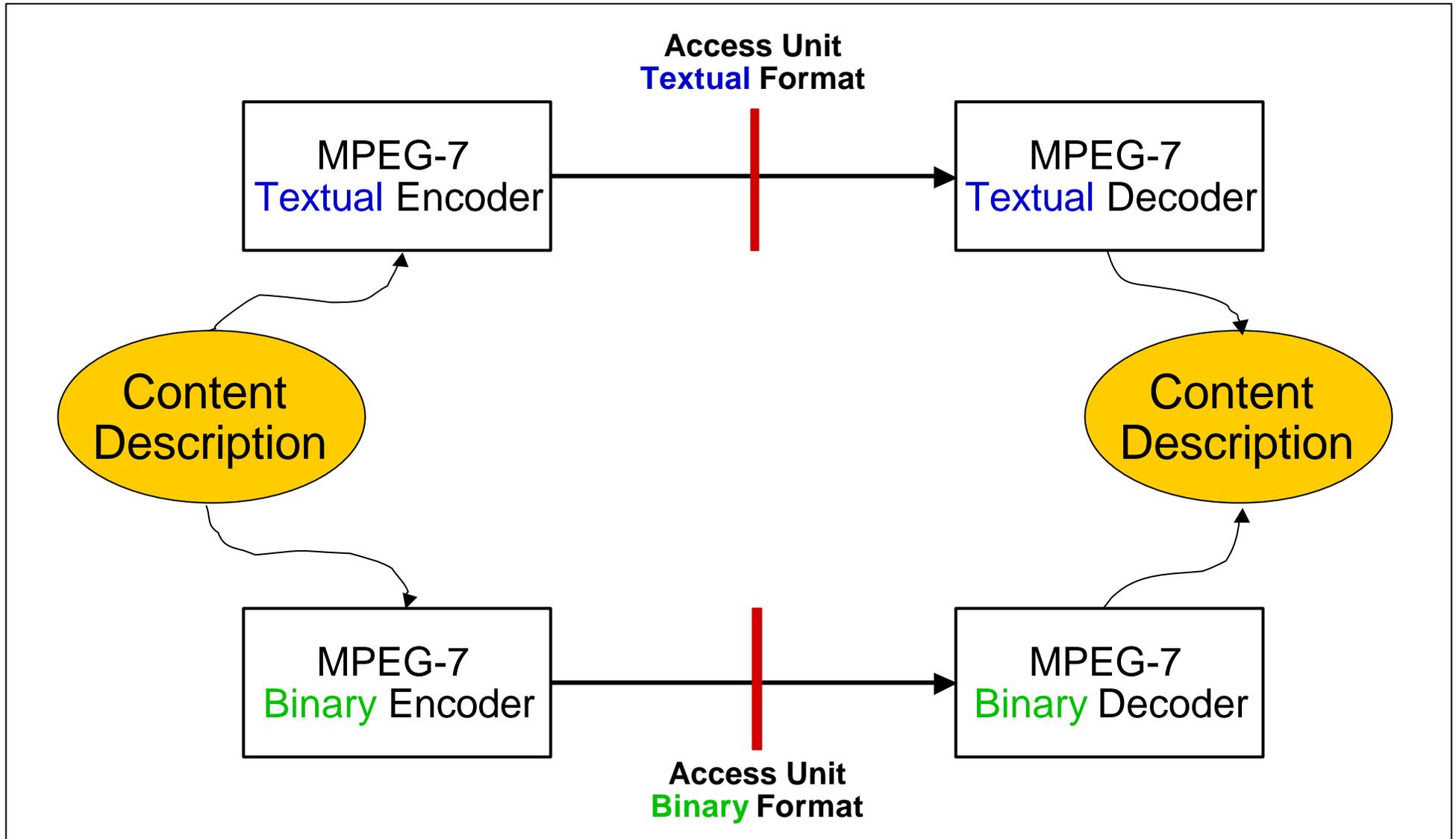
Tasks of MPEG-7 Systems - flexible transmission



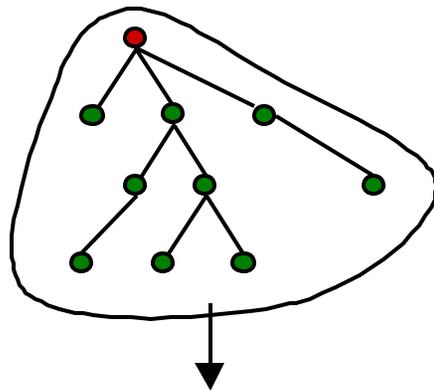
Tasks of MPEG-7 Systems - dynamic update



MPEG-7 Systems Tools

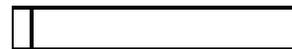
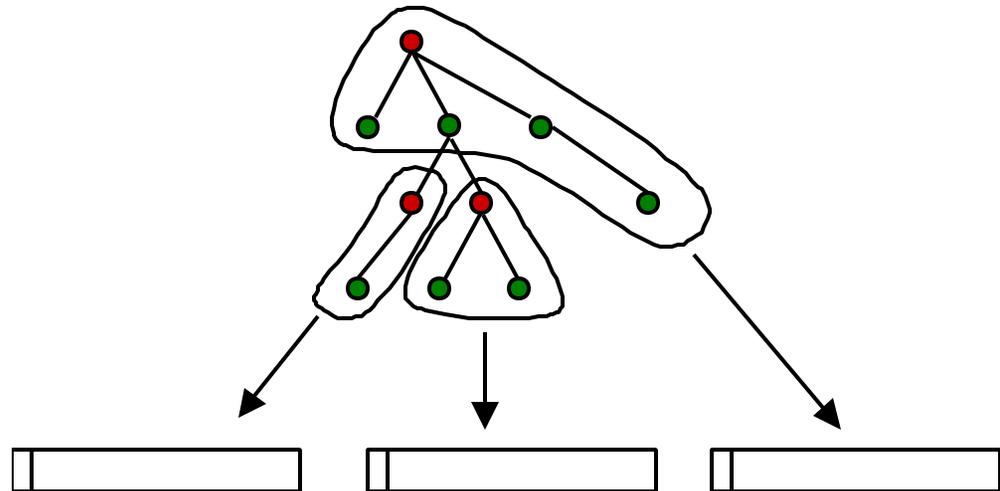


Flexible Transmission of MPEG-7 Descriptions



Access Unit

Transmission of a whole tree in one access unit



Access Unit



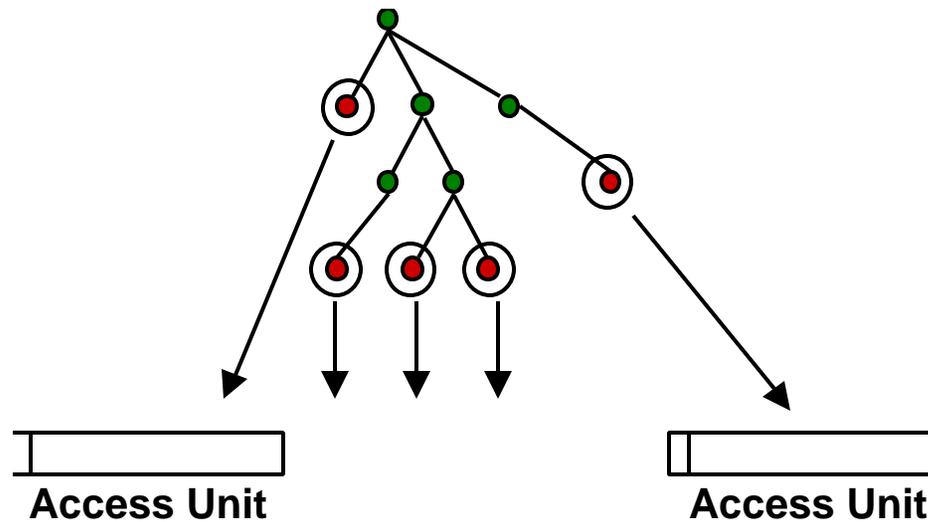
Access Unit



Access Unit

Transmission of sub-trees (fragments) in several access units

Flexible Transmission of MPEG-7 Descriptions



Transmission of each single leaf in a separate access units

Flexible Transmission of MPEG-7 Descriptions

MPEG-7 Access Unit

- Contains a part of an MPEG-7 description
- Smallest entity to which time stamps can be attached
- Can be mapped into different transport layers

Finer granularity

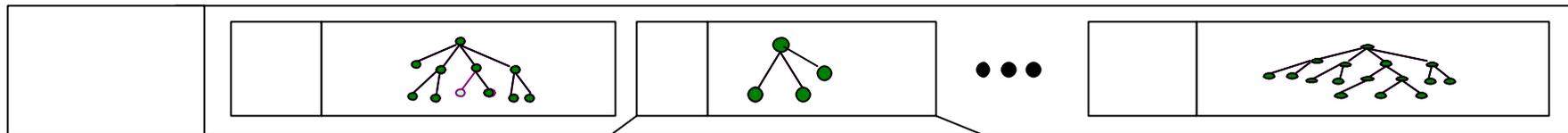
- More than one sub-tree may need the same time
- Access Units may contain more than one sub-tree
- ➔ Sub-division of an Access Unit into several Fragment Update Units

Flexible Transmission of MPEG-7 Descriptions

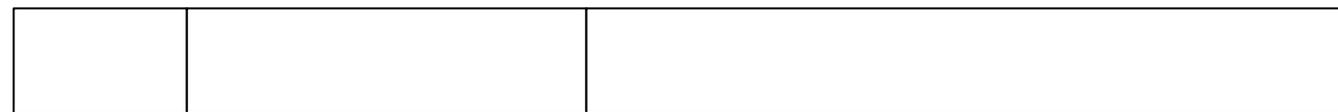
MPEG-7 Access Unit:

Header

Body



Fragment Update Unit:



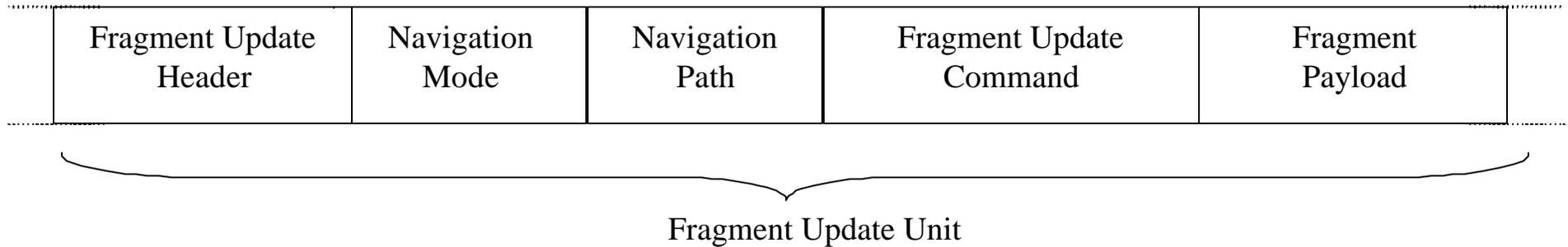
Header

Navigation

Payload

Flexible Transmission of MPEG-7 Descriptions

Fragment Update Unit - some more insight

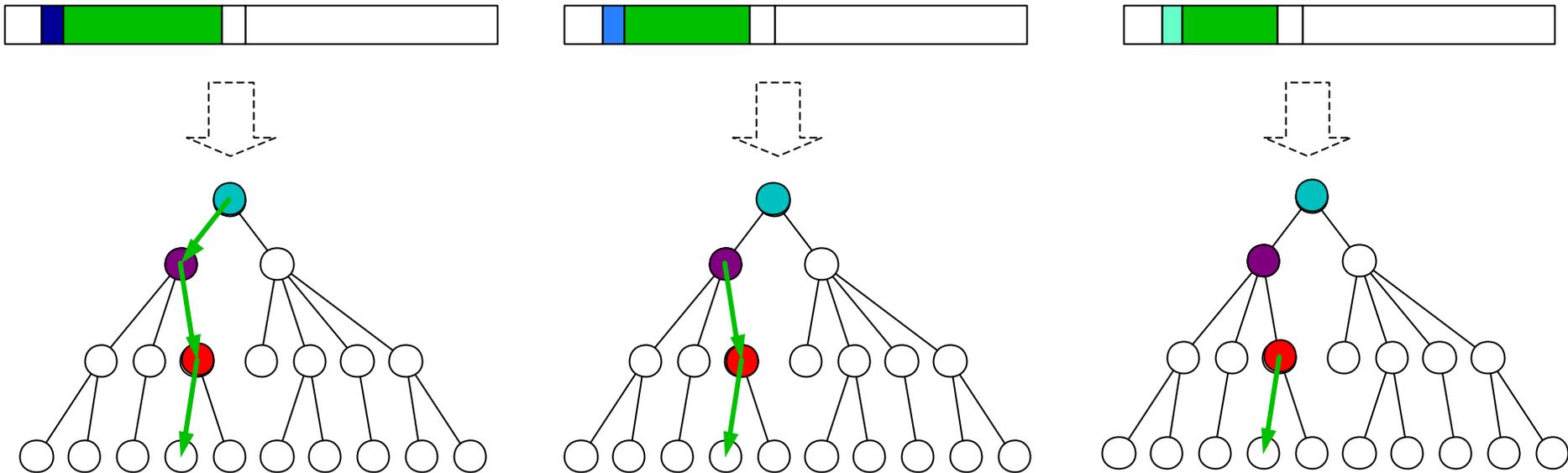


- Fragment Update header:** parameters to decode fragment unit
- Navigation mode:** specifies kind of addressing
- Navigation path:** specifies path to the destination node
- Fragment update command:** specifies command: add, change, delete
- Fragment payload:** sub-tree (fragment) data

Flexible Transmission of MPEG-7 Descriptions

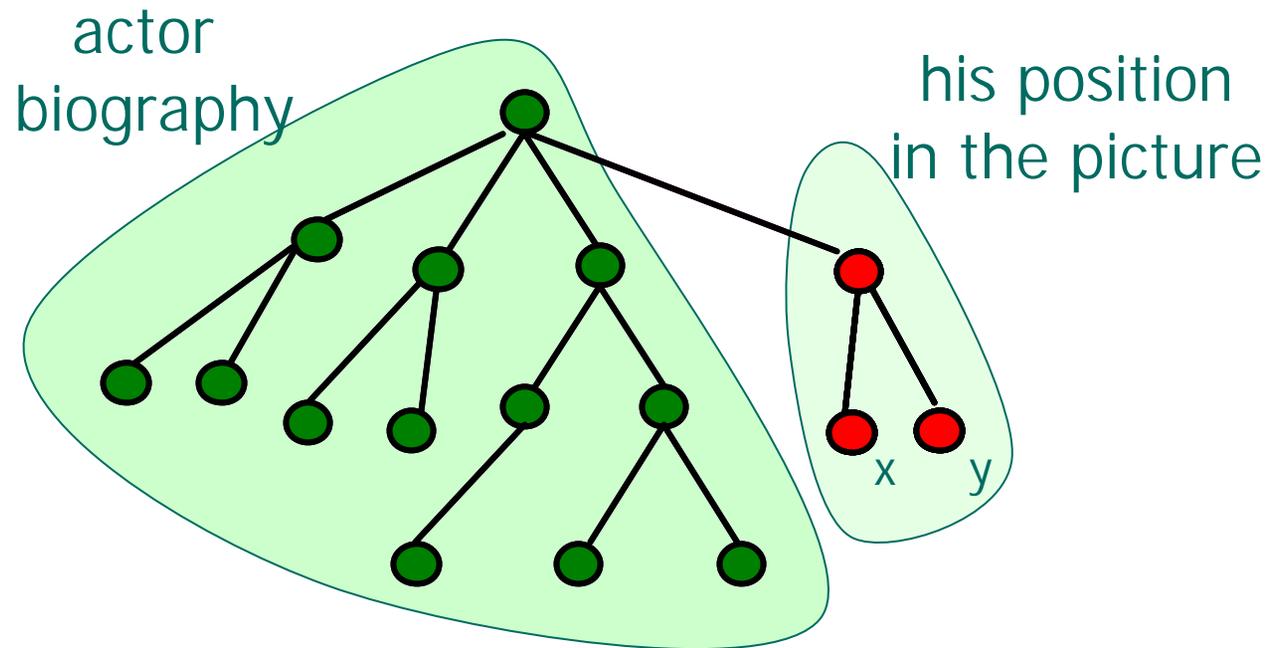
Navigation in description trees

- Absolute wrt. the root node (●)
- Absolute wrt. the top-level node (●) of the current DS
- Relative wrt. the current node (●)



Flexible Transmission of MPEG-7 Descriptions

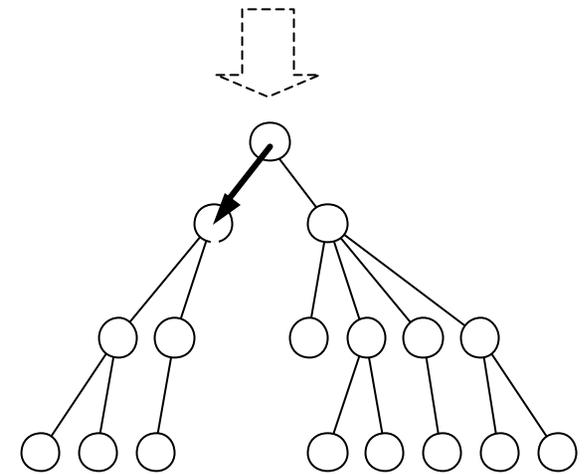
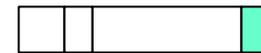
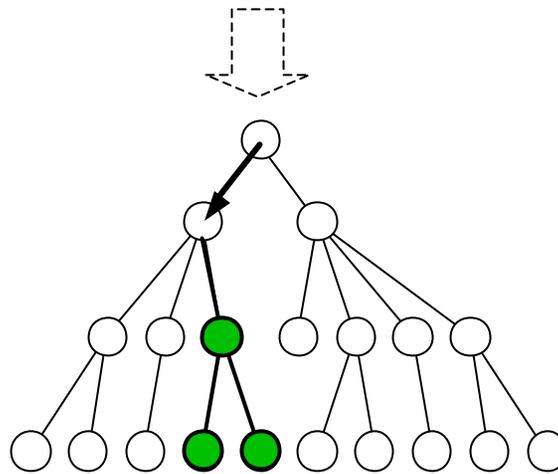
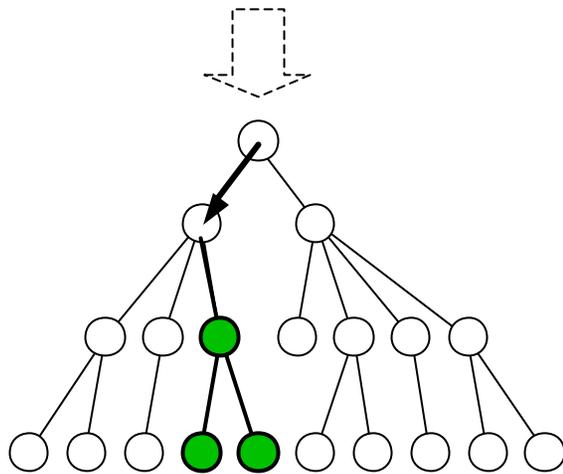
Dynamic update of descriptions - an example



Flexible Transmission of MPEG-7 Descriptions

Dynamic update by fragment update commands

- Add:** add a sub-tree at the current node
- Change:** change a sub-tree at the current node
- Delete:** delete sub-tree at the current node

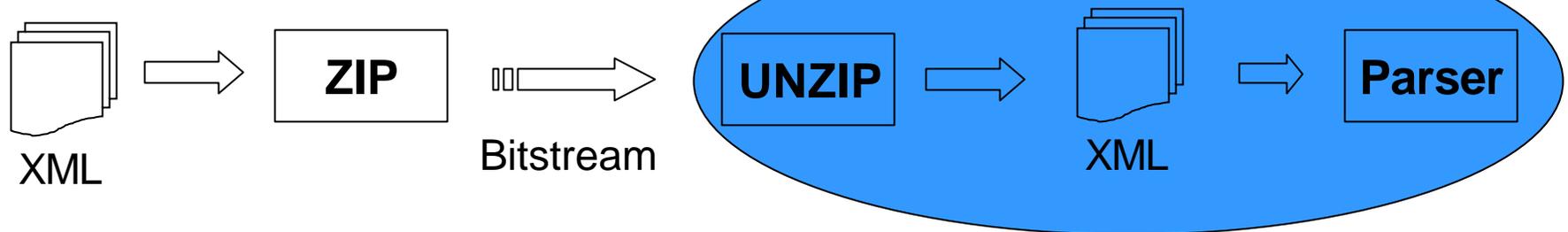


Compression of MPEG-7 Descriptions

Rationale for compression

- MPEG-7 descriptions represented using XML
- XML is human readable, but very verbose
- Not appropriate for bandwidth efficient storage or transmission

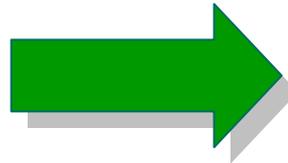
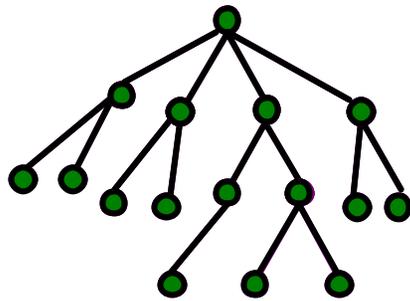
Why not just „zip“ it?



- [Browse/Search application](#) needs unzip and DDL/XML parser
- Not really appropriate for streaming applications

Compression of MPEG-7 Descriptions

Binary format for MPEG-7 data: MPEG-7 BiM



011010100110...

Compression of MPEG-7 Descriptions

The BiM allows

- the bandwidth efficient binary transmission or storage,
- the dynamic update and the flexible streaming and
- searching or filtering on bitstream level

of MPEG-7 DS instances

BiM basic features

- High compression ratio for structure up to 98%
- Specific datatype encoding leads to general compression of about 80%
- Generic XML encoding tool allowing extension of MPEG-7 Description Schemes

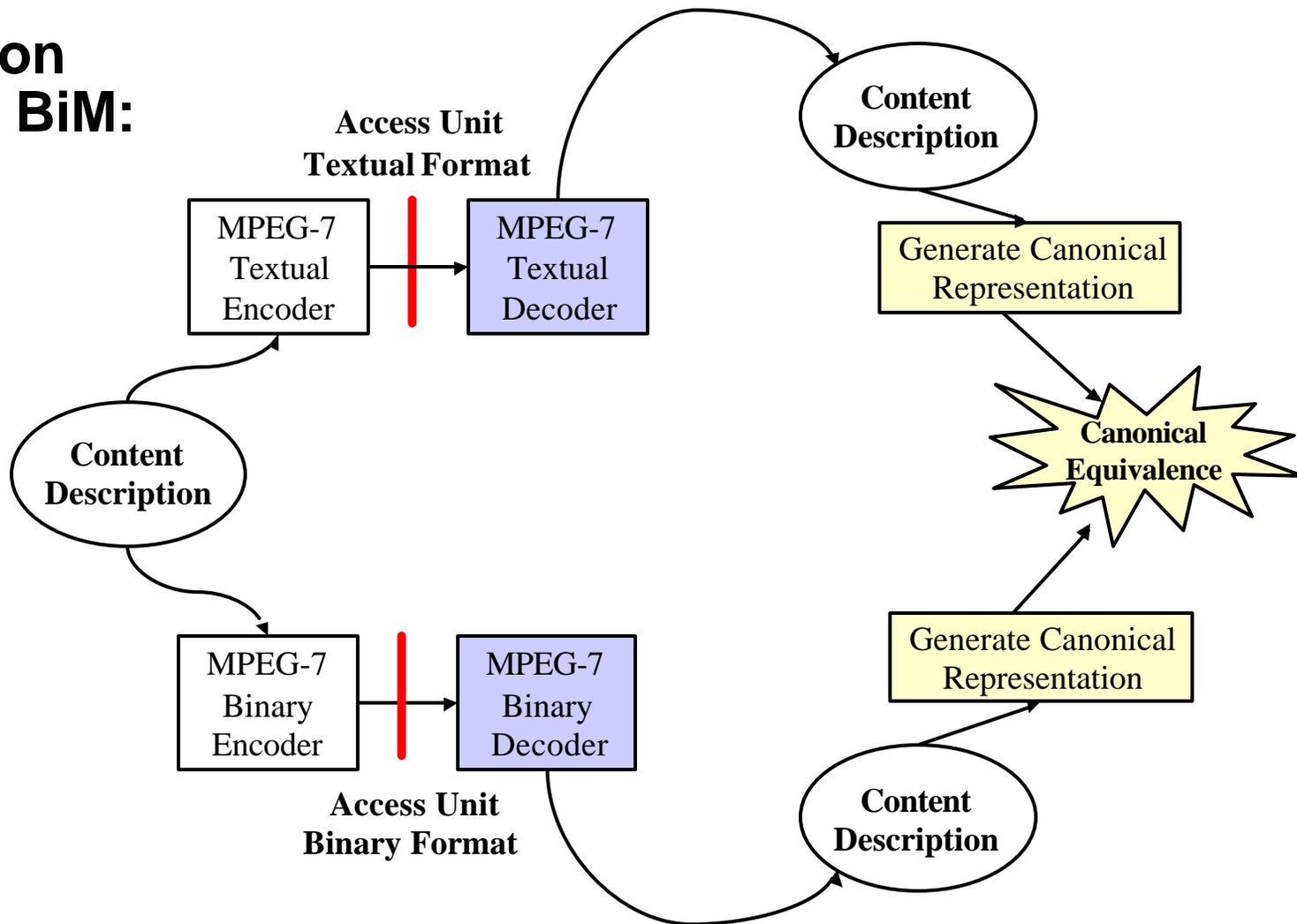
Compression of MPEG-7 Descriptions

Relation to MPEG-7 textual format (XML)

- A bi-directional mapping between the BiM and the textual format is provided
 - When encode an MPEG-7 XML-file into BiM and then back to MPEG-7 XML, both XML files are „canonically“ equivalent
 - XML canonical format is specified by W3C
 - Order of elements preserved
 - Order of attributes ignored
 - White spaces and XML comments are not preserved
- ➔ The transmission of an MPEG-7 XML file and of the corresponding BiM stream result in identical descriptions

Compression of MPEG-7 Descriptions

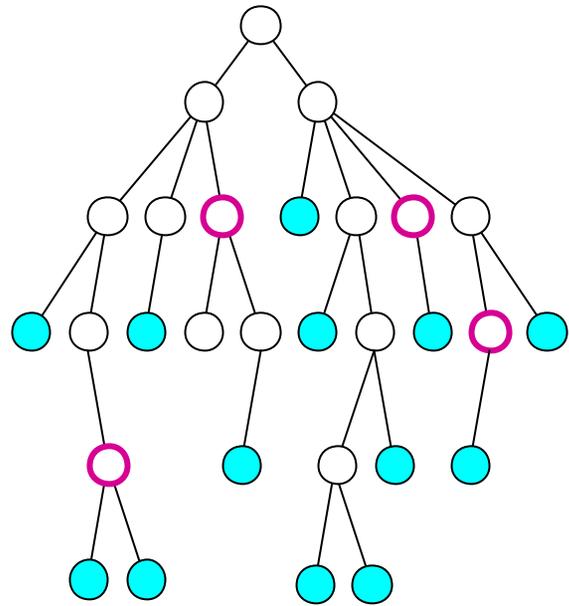
Relation XML - BiM:



Compression of MPEG-7 Descriptions

How does it work?

- BiM is „schema aware“, i.e. the knowledge of the schema is exploited for efficient encoding

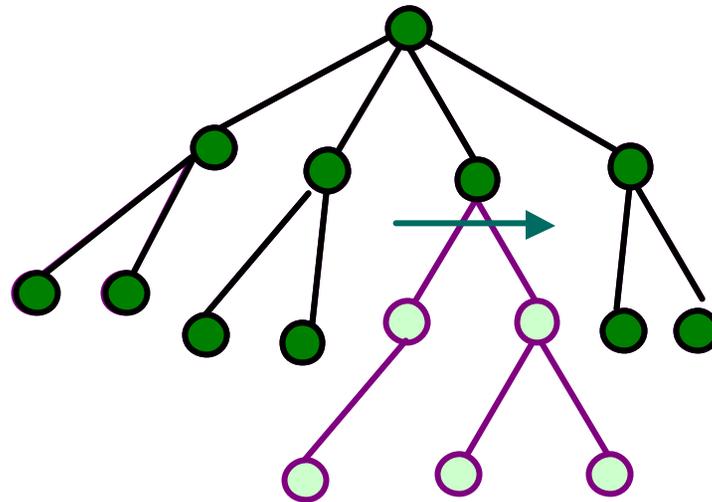


MPEG-7 DS

- Path through binary tree is encoded
- Assign codes to optional elements (○)
- Mandatory elements need no codeword
- Only leaf nodes (●) contain data
- Specific datatype encoding is applied

Compression of MPEG-7 Descriptions

Further features - fast skipping of undesired parts



Conclusions

The MPEG-7 Systems tools allow

- flexible transmission and dynamic update of MPEG-7 Descriptions in arbitrary order
- choice between textual and binary format
- bandwidth efficient transport and storage of MPEG-7 Descriptions using MPEG-7 BiM
- searching and filtering of MPEG-7 Descriptions on textual and on binary level

Acknowledgements

- Thanks to Claude for some of the slides
- Thanks to the whole BiM group for hard work